

Base from U.S. Bureau  
of Indian Affairs, 1976

Geology west of 108° adopted from Hayes,  
Vogel, and Wyatt (1972) Geology East of  
108° adopted from Stevens, Lipman, Hall,  
Baker, and Luedke (1974)

DESCRIPTION OF GEOLOGIC UNITS AND THEIR PHYSICAL AND HYDROLOGIC PROPERTIES

System	Series	Geologic unit	Symbol	Maximum thickness (feet)	Physical characteristics	Hydrologic characteristics
QUATERNARY	Holocene	Flood-plain deposits	Qal	50	Clay, silt, sand, gravel, and boulders. Generally poorly sorted and confined to present-day stream valleys.	Reported well yields are as much as 25 gal/min, but average 10 gal/min. Water quality is variable, depending on underlying rock and sources of alluvial material. Dissolved-solids concentrations ranged from 148 to 5,390 mg/L. Arsenic, fluoride, iron, manganese, selenium, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Pleistocene	Terrace deposits	Qti	100	Clay, silt, sand, gravel, and boulders. Sediments are poorly sorted with coarser materials being well rounded. Remnants of alluvial fans and higher level stream valleys.	Reported well yields are as much as 50 gal/min, but generally range from 5 to 10 gal/min. Dissolved-solids concentrations ranged from 205 to 870 mg/L. Chloride, fluoride, iron, selenium, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Pliocene(?)					
TERTIARY	Eocene	San Jose Formation	Tsj	2,500	Sandstone, shale, and conglomerate. Sandstones are arkosic and massive and are interbedded with red, maroon, and gray shales.	Reported well yields are as much as 75 gal/min; yields of 1 to 10 gal/min are more common. Dissolved-solids concentrations ranged from 117 to 2,910 mg/L. Concentrations of arsenic, chloride, fluoride, iron, manganese, nitrate, selenium, sulfate, and dissolved solids locally occurred in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Paleocene	Animas Formation	TKa	1,400	Varicolored shale, with interbedded breccia, conglomerate, and tuffaceous sandstone. The sandstone varies from light to rusty brown and contains abundant silicified wood and clay balls. Exposed in area between the Animas River and the La Plata-Archuleta County line south of Durango. Locally contains the Nacimiento Formation in the western part of the area.	Reported well yields are as much as 75 gal/min, but yields of 1 to 10 gal/min are more common. Dissolved-solids concentrations ranged from 115 to 3,490 mg/L. Arsenic, chloride, fluoride, iron, manganese, nitrate, selenium, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water. Flowing wells may be developed in areas where sandstones are overlain by impermeable shales.
CRETACEOUS		Kirtland Shale	Kk	1,200	Interbedded sandstone, shale, and siltstone. The shales are olive to medium gray with varying amounts of silicified wood and thin lenses of silty clay and friable sandstone. The middle unit, the Farmington Sandstone Member, is thick to massive, with crossbedding being characteristic.	Reported well yields are as much as 5 gal/min. Dissolved-solids concentrations ranged from 1,120 to 4,450 mg/L. Arsenic, iron, manganese, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Upper Cretaceous	Fruitland Formation	Kfp	300	Varying proportions of interbedded sandstone, shale, and coal. The fine- to medium-grained sandstone beds, which are gray, brown, and olive in color, grade laterally and vertically into shales and siltstones. The upper sandstone beds are well indurated and form resistant ledges.	No information from wells available. Sandstones may be an aquifer near area of outcrop. Well yields are estimated to be less than 5 gal/min. Water from two springs sampled had dissolved-solids concentrations of 3,120 and 3,800 mg/L. Iron, manganese, sulfate, and dissolved solids occurred in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
		Pictured Cliffs Sandstone	Kpc	300	Sandstone, light-olive-gray, to grayish-orange and orange, well-sorted. Fine- to medium-grained, medium- to thick-bedded, and cliff-forming. Interbedded with small amounts of shale and siltstone. Kkp—Kirtland, Fruitland, and Pictured Cliffs Formations, undivided.	Reported well yields are as much as 5 gal/min. Dissolved-solids concentrations ranged from 222 to 1,630 mg/L. Fluoride, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water. Flowing wells may be developed in areas where sandstone is overlain by impermeable shales.

System	Series	Geologic unit	Symbol	Maximum thickness (feet)	Physical characteristics	Hydrologic characteristics
CRETACEOUS (Continued)		Lewis Shale	Kl	1,800	Shale, light- to dark-gray and black. Marine origin. Contains interbeds of light-gray sandstone, sandy to silty limestone, and several calcareous concretions.	Reported well yields are as much as 3 gal/min. Dissolved-solids concentrations ranged from 428 to 3,370 mg/L. Chloride, iron, nitrate, selenium, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Upper Cretaceous (Continued)	Cliff House Sandstone	Kmv	350	Gray, calcareous, marine sandstone, and silty shale; crossbedded and massive in places.	Reported well yields are as much as 5 gal/min. Dissolved-solids concentrations ranged from 372 to 3,500 mg/L. Fluoride, iron, manganese, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water. Flowing wells may be developed in areas where sandstone is overlain by impermeable shales.
		Menefer Formation	Kmv	350	Varying proportions of light-gray sandstone, siltstone, and shale with several interbedded coal seams.	Reported well yields are as much as 5 gal/min. Dissolved-solids concentrations ranged from 1,590 to 7,170 mg/L. Fluoride, iron, sulfate, and dissolved solids locally occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water. Flowing wells may be developed in areas where sandstone is overlain by impermeable shales.
		Point Lookout Sandstone	Kmv	400	Light-gray to brown marine sandstone, massive and cliff-forming. Contains interbedded siltstone and shale in the lower part.	No wells sampled; well yields and water quality may be similar to well yields and water quality from Cliff House Sandstone. Flowing wells may be developed in areas where sandstone is overlain by impermeable shales.
		Manco Shale	Km	1,900	Dark-gray silty and sandy marine shale. Contains some interbedded sandstones and locally fossiliferous.	Only one sample collected; well yield reported as 1 gal/min. Dissolved-solids concentration was 1,250 mg/L. Selenium, sulfate, and dissolved solids occurred in concentrations in excess of U.S. Public Health Service (1962) recommended limits for drinking water.
	Upper and Lower Cretaceous	Dakota Sandstone	Kdb	200	Sandstone, light-gray to yellowish-brown, with interbedded siltstone, black carbonaceous shale, and coal. Contains many conglomerate lenses near the base.	No wells sampled on the reservation. Data from wells immediately north of the reservation indicate well yields may be as much as 5 gal/min and dissolved-solids concentrations may range from 273 to 440 mg/L. Flowing wells may be developed in areas where sandstone is overlain by impermeable shales.
		Burno Canyon Formation	Kmb	100	Interbedded conglomerate and grayish-green shale, with light-brown sandstone lenses.	No information available. Not considered an aquifer on the reservation.
JURASSIC	Upper and Middle Jurassic	Morrison and Wanakah Formations	Jmw	1,100(?)	Interbedded claystone, siltstone, and sandstone.	No information available. Not considered an aquifer on the reservation.

**EXPLANATION**

Shaded areas are Indian lands, unshaded areas are private lands

INTRUSIVE ROCKS AND DIKES OF TERTIARY AGE

CONTACT—Dashed where approximately located

FAULT—Ball on downthrown side

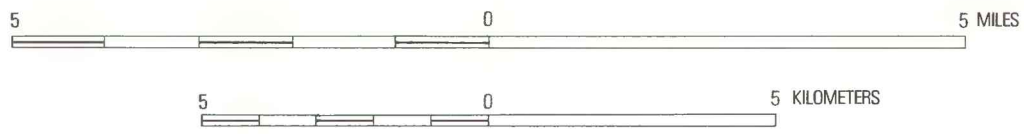
AREA WHERE SELENIUM CONCENTRATIONS IN WATER USUALLY EXCEED 10 MICROGRAMS PER LITER

WELL

SPRING

As ABBREVIATION FOR CHEMICAL CONSTITUENT THAT EXCEEDED U.S. PUBLIC HEALTH SERVICE (1962) RECOMMENDED LIMITS FOR DRINKING WATER—Shown by well and spring symbols only where individual constituent exceeded limit

As—Arsenic  
Cl—Chloride  
Ds—Dissolved solids  
Fl—Fluoride  
Fe—Iron  
Mn—Manganese  
N—Nitrate plus nitrate as N or dissolved nitrate as NO<sub>3</sub>  
Se—Selenium  
SO<sub>4</sub>—Sulfate



GEOHYDROLOGIC MAP OF THE SOUTHERN UTE INDIAN RESERVATION, SOUTHWESTERN COLORADO